

# **APPENDIX I**

## **IRONWOOD FOREST NATIONAL MONUMENT SHOOTING ANALYSIS SUMMARY**

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### **INTRODUCTION**

The preferred management action in the Ironwood Forest National Monument (IFNM) Draft Resource Management Plan (RMP) to prohibit target shooting in the monument generated a great deal of controversy and public interest. BLM received many comments both in favor of and against the prohibition. Due to the number of questions regarding the prohibition, and the high level of public interest surrounding it, BLM chose to re-examine the decision and go through a well-documented, methodological, and transparent analysis to determine if there are areas on the IFNM that could potentially support the continuation of target shooting into the future, given the management constraints, safety considerations, and protected status of the IFNM.

### **SHOOTING ON IRONWOOD FOREST NATIONAL MONUMENT**

Target shooting is currently allowed on BLM lands throughout the entire IFNM, except where prohibited by law (for example, within a quarter-mile of an occupied residence). Target shooting is prohibited on State Trust lands within the IFNM boundary, and throughout all of Arizona, per Arizona State Land Department regulations. Target shooting activity is dispersed throughout the IFNM and recurring activity has been documented at over 30 individual locations. Because IFNM is easily accessed by several residential areas bordering the monument, and sits in close proximity to Tucson and other outlying population centers, it has become a regular destination for visitors wanting to engage in unregulated shooting and plinking.

Target shooting has increasingly become a management concern on the IFNM as the number of visitors, including shooters, has increased. The intensity at which this activity now occurs on the monument is causing new noticeable impacts, reaching levels that monument resources may not be able to sustain. The IFNM was established in 2000 by Presidential Proclamation 7320, “for the purpose of protecting the objects identified [in the Proclamation] <sup>1</sup>,” which include resources such as Sonoran Desert vegetation, wildlife species, archeological sites and artifacts, and geological resources. The Proclamation, derived from authorities given through the Antiquities Act, set a relatively high standard of protection for objects within the IFNM, prohibiting injury, destruction, or removal of any feature in the monument. Through monitoring and visitor contacts, BLM has found that target shooting, because of the magnitude and intensity of the activity, is causing damage to monument objects in localized areas and presenting conflicts with other monument users. Current trends based on rapid growth of the areas surrounding the monument indicate that these impacts are likely to increase in scale as more IFNM visitors engage in target shooting.

### **SHOOTING ANALYSIS PROCESS**

BLM initiated the IFNM shooting analysis by identifying various criteria to apply to monument lands with regard to target shooting. Criteria were developed in consideration of existing laws and regulations governing shooting, the provisions of Presidential Proclamation 7320, safe shooting practices and guidelines, and the RMP goals and objectives. It was determined that a Geographic Information System (GIS) spatial analysis, followed up by on-site visits, would be the most effective and objective approach

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<sup>1</sup> Presidential Proclamation 7320, Monday June 12, 2000. Volume 36, Issue 23; ISSN: 0511-4187. Proclamation 7320 – Establishment of the Ironwood Forest National Monument.

to evaluating the various criteria and subsequently in answering the question posed for this analysis (whether there are areas on the IFNM that could potentially support the continuation of target shooting into the future). Thus, two sets of criteria were established:

1. Criteria that could predominantly be evaluated through a spatial analysis (where relevant spatial data exist or could easily be generated)
2. Criteria that would need to be evaluated through field work and on-site visits (where relevant data cannot be mapped by GIS, have never been mapped, or are too site-specific to be feasible for GIS application)

Criteria are listed in Table 1, with further explanation of specifications and rationale for each criterion provided in Sections 1 and 2, below.

**Table 1: Shooting Analysis Criteria**

1. Criteria applied through GIS analysis	2. Criteria applied through on-site visits
<p>1.1 Significant presence of monument objects or high natural and cultural resource sensitivity</p> <p>1.2 Existing law regarding target shooting</p> <p>1.3 Areas with high sensitivity to noise generated from target shooting (nearby residences, etc.)</p> <p>1.4 Presence of suitable terrain for shooting (existing natural backstop or berm)</p>	<p>2.1 Significant presence of monument objects or high natural and cultural resource sensitivity that was not captured through GIS analysis</p> <p>2.2 Visitor safety and experience; areas where safety would be jeopardized, where shooting is incompatible with other uses, or where it could result in adverse impacts to facilities, public use sites or other BLM and private assets</p> <p>2.3 Accessibility</p> <p>2.4 Physical suitability of terrain for shooting activity (factors not captured through GIS analysis)</p>

## 1. Criteria Evaluated through GIS Analysis

### 1.1 Significant presence of monument objects or high natural and cultural resource sensitivity

BLM identified areas in the monument where target shooting would be incompatible with IFNM management objectives related to the protection of monument objects and resources. BLM used existing resource data that captured the biological, cultural, and geological resources that must be protected per the Presidential Proclamation, by way of the Antiquities Act, or as provided for in the management goals and objectives established for the IFNM in the RMP. BLM used the following data layers to identify areas with a significant presence of monument objects or with high natural and cultural resource sensitivity, where concentrated target shooting would be likely to cause damage or destruction of known monument resources:

- **Desert Tortoise Habitat, Categories I and II (46,169 acres – Map I-1)**  
Rationale: BLM's Desert Tortoise Habitat Management Plan establishes the policy of "no net loss in quantity or quality of Category I and II Habitat Areas<sup>2</sup>." Target shooting into hillsides/rocky

<sup>2</sup> Desert Tortoise Habitat Management on the Public Lands: A Rangewide Plan, U.S. Dept of the Interior, Bureau of Land Management, November 1988, at page 19.

areas within tortoise habitat can have detrimental effects to local tortoise populations, including direct impacts from bullets (tortoises resemble rocks and blend in with surroundings), damage to physical habitat with large caliber ammunition, degradation of habitat through loss of vegetation used as forage, rock and soil pulverization, and dumped trash from used targets and other litter. Trash also attracts predators which makes tortoises more susceptible to predation. BLM is committed to maintaining viable tortoise populations in Category I and II habitats through implementation of specific management actions. Areas identified as Category III are of lower value in maintaining viable populations of tortoises on public lands, and thus can be subjected to lower management intensity specifically for tortoise' than habitats in the other categories. Thus, Category III habitat was not included because lower densities of tortoise makes direct harm less likely and indirect harm to habitat less significant. See Map I-1 for location of desert tortoise Category I and II Habitat Areas.

- **Significant Vegetation (28,746 acres – Map I-2)**

Rationale: This data set includes dense Arizona upland patches, Lower Colorado River Valley xeroriparian areas, areas with dense and large ironwoods, jojoba chaparral, xeroriparian woodlands, dense and large saguaro stands, and cactus dunes, among other vegetation types that are considered to be sensitive because of high biological diversity, vulnerability to disturbance, or rarity. Several are specifically mentioned in the proclamation. Some of these vegetation types, such as saguaro, are especially susceptible to shooting damage, as intentional or incidental destruction of saguaro is commonly found at shooting sites. Saguaros are also an Arizona Protected Native Plant<sup>3</sup> that provide habitat, cavity nesting, and forage for threatened and endangered species (such as the lesser long nosed bat on the IFNM) and numerous other species. Several of these vegetation types also provide nesting habitat for raptors and migratory birds, cactus ferruginous pygmy owl habitat in certain areas, and thermal cover for mammalian species.

- **Rare Plants (4,809 acres – Map I-3)**

Rationale: This data set includes uncommon perennial plants, many of which are relict populations of species that were widespread during the late Pleistocene, such as Parish goldeneye and cuneate turpentine bush. The populations of various other plants such as the Sonoran rose mallow are isolates of plants that are common in more tropical areas in Sonora, Mexico, but very rare in the Sonoran Desert of Arizona. Plants in this data layer are considered rare and vulnerable, and are especially susceptible to disturbance. Plants are often the first casualty at shooting sites because they are used to support targets, are found behind targets, and are more susceptible to direct shooting impacts toward the ground as well as impacts from trampling (from placing and recovering targets). Many of these species consist of small populations or possibly one or two individual plants, and would be susceptible to destruction and total loss as a result of concentrated shooting activity. This data set includes a quarter-mile buffer around each plant.

- **Vegetation Habitat Management Areas (9,058 acres – Map I-4)**

Rationale: This data set includes the Waterman Mountains and Ragged Top Vegetation Habitat Management Areas (VHA), both of which are proposed for designation in the IFNM RMP. The vegetation in these areas is considered sensitive because of its rarity, ecological diversity, or vulnerability to disturbance by human trampling, fire, or invasion by exotic plants. The Waterman Mountains VHA contains habitat for a listed endangered species of cactus (Nichol Turk's head cactus) and the Ragged Top VHA contains an unusually high concentration of rare plants.

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<sup>3</sup> See <http://www.azda.gov/esd/nativeplants.htm> (last visited 5/30/08) for listing of Arizona Protected Native Plants and laws governing their use and protection.

- Desert Bighorn Sheep Wildlife Habitat Management Area (30,692 acres – Map I-5)**  
Rationale: This data set includes the Desert Bighorn Sheep Wildlife Habitat Management Area, as proposed in the IFNM RMP. The range of the bighorn population in the IFNM is generally limited to the central part of the monument, predominately in the Silverbell Mountains. This confinement leaves the population vulnerable to elimination through disease outbreaks or other catastrophic events. Disruptions to breeding activities from target shooting could prevent BLM and Arizona Game and Fish Department (AGFD) efforts to help the sheep to re-establish a sub population in the Waterman Mountains that would help ensure against elimination of the sheep population through a catastrophic event.
- Inventoried Cultural Sites (1,530 acres)**  
Rationale: This data set includes catalogued cultural sites from various inventories that have occurred throughout the IFNM. Permanent damage to petroglyph sites and other cultural resources can occur from direct bullet impact and ricochet. Associated damage can also occur as a result of excessive vehicle and human trampling, trash accumulation, and indirect impacts including unauthorized collection of artifacts and vandalism. Site types most likely to be impacted by bullets are standing structures and petroglyphs. Site types most likely to be impacted by vehicles, trampling, incidental erosion, and trash include artifact scatters, campsites, villages, historic archaeological sites, historic and prehistoric trails, and standing structures. Many archeological sites on the IFNM are considered sacred by the neighboring Tohono O'odham Nation. Note that only about 15% of the IFNM has been inventoried for cultural resources, so the data for cultural resources is incomplete, and additional surveys and on-site evaluation would be required for any areas found to be potentially suitable for shooting. Due to protection of archeological data under the Archeological Resources Protection Act and the National Historic Preservation Act, cultural sites are not displayed on the attached maps.
- Visual Resources from Primary Roads (7,855 acres – Map I-6)**  
Rationale: Visual contrast and potential impacts were considered based on the IFNM RMP management goal to “preserve the monument’s natural and scenic visual values,” and because the scenic qualities of IFNM are specifically mentioned in the proclamation. This data set consists of a quarter-mile buffer from the primary road network and five principle touring routes in the IFNM, including Manville Road, Avra Valley Road, Pump Station Road, Silverbell Road, and Sasco Road. The primary road network will carry the bulk of public recreational traffic in the monument, and the scenery along these routes is an important resource. Target shooting activity causes noticeable visual impacts that can detract from the natural landscape and sight-seeing by visitors, particularly areas visible in the foreground viewing distance from the roads.

Of the 128,000 total BLM acres in the IFNM, a total of 77,585 acres<sup>4</sup> were identified as having sensitive resources present (see Map I-7). This acreage was eliminated from further consideration for target shooting activity.

<sup>4</sup> Several of the sensitive resource areas overlap, so this number does not reflect a total sum of the resource acreages listed with each resource on pages 3-5.

## 1.2 Existing Laws and Regulations

Certain laws, regulations and statutes governing shooting on public lands in Arizona effectively restrict shooting activity in some areas of BLM administered land that are otherwise open for this purpose. Where possible, BLM mapped these areas within the IFNM in order to avoid them in this analysis. Arizona Revised Statute (A.R.S.) 17-309a(4), includes the following restriction:

*A.R.S. 17-309a(4): It is unlawful for a person to discharge a firearm while taking wildlife within one-fourth mile of an occupied farmhouse or other residence, cabin, lodge or building without permission of the owner or resident.*

Known as the “quarter-mile law,” A.R.S. 17-309a(4) contains a specific measurement of one quarter-mile that BLM included in its spatial analysis to depict areas where shooting is restricted due to proximity to occupied residences. Quarter-mile buffers were placed around occupied residences within the monument (and outside of the monument where residences are located within a quarter-mile of its boundary).

Current federal regulations also contain the following restriction on shooting:

*43 CFR 8365.2-5: On developed recreation sites and areas, unless otherwise authorized, no person shall: (a) Discharge or use firearms, other weapons, or fireworks*

While IFNM does contain areas that are frequently used for recreation, no “developed recreation sites” exist, and none are proposed in the RMP. Therefore, this regulation was not considered during this analysis.

Restrictions on shooting in relationship to the locations of roads and railways are also found in current law:

*A.R.S. 17-301b: No person may knowingly discharge any firearm or shoot any other device upon, from, across or into a road or railway.*

While the location of roads in the IFNM can be mapped, this restriction could not feasibly be included in the GIS analysis because the position of the shooter would need to be known to determine if a road was in the shooter’s shooting fan. This law was considered during on-site visits where the potential location of the shooter could be reasonably determined (see section 2.2, below).

Of the 128,000 total BLM acres in the IFNM, 1,643 acres fall within a quarter-mile of occupied residences (see Map I-7). Combined with the acreage of areas with high resource sensitivity (77,585 acres) a cumulative sum of approximately 78,538<sup>5</sup> acres were eliminated from further consideration as being suitable for shooting activity.

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<sup>5</sup> Of the 1,643 acres falling within a quarter-mile of occupied residences, 953 acres did not overlap with areas eliminated for sensitive resources. Thus,  $953 + 77,585 = 78,538$ .

### 1.3 Areas with high sensitivity to shooting noise

A.R.S. 17-602 sets a limit on the amount of noise that can be emitted from outdoor shooting ranges in Arizona to an Leq(h) (hourly average) of 64 dBA within a mile of residences and other similarly occupied structures, and areas that are zoned for such structures. Section 17-602(B) includes the provision that “*ranges that are located at least one mile from areas that are zoned for residences, schools, hotels, motels, hospitals or churches are exempt from this subsection,*” implying that an Leq(h) of 64 dBA is typically reached at a distance of less than a mile from the source. BLM has used the one-mile measurement as a guideline for this shooting analysis by placing a one mile noise buffer from a “person's residence, school, hotel, motel, hospital or church, or the proposed location . . . if the property is zoned for such a structure but is currently unimproved” (17-602(E)1).

While this law applies to shooting ranges and not dispersed, undeveloped shooting activity, recreational target shooting on the IFNM is typically concentrated to select areas, and noise emitted from these areas can be comparable to shooting ranges during high points of activity. Noise measurements are variable depending upon various factors including type of firearm being used (which is not regulated on public lands) and specific characteristics of the area, and exceptions will exist where an hourly average of 64 dBA is reached well before and beyond one mile. For example, while shooting on the IFNM would not generally be at the same intensity of a shooting range, ambient noise levels on the monument are much lower than those typically associated with developed areas where ranges would be located. Recognizing the variable nature of these measurements, BLM has used the one-mile measurement from A.R.S. 17-602 as a standard for noise measurement.

Of the 128,000 total BLM acres in the IFNM, 22,078 acres fall within the one-mile noise buffer from residences and areas slated for residential use development (see Map I-8). Combined with the acreage of areas with high resource sensitivity (77,585 acres) and areas within a quarter mile of occupied residences (1,643) a cumulative sum of approximately 86,244<sup>6</sup> acres were eliminated from further consideration as being suitable for shooting activity.

### 1.4 Presence of suitable terrain for shooting (existing natural backstops)

Under the Code of Federal Regulations, it is unlawful to create a public hazard, public nuisance, or create a risk to other persons on public lands (43 CFR 8365 1-4). In order for dispersed, undeveloped target shooting to occur in a safe environment on public lands without risk to others, a natural backstop or berm with sufficient dimensions must be located behind the target. There are large flat areas in the IFNM where target shooting is naturally precluded due to the absence of any natural backstops. The BLM used a GIS terrain analysis to identify areas in the monument where target shooting could safely occur based on the location of natural backstops or berms. The BLM used information from the following sources to establish appropriate safety criteria and develop guidelines for the terrain analysis:

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<sup>6</sup> Of the 22,078 acres falling within a mile of current and future residential areas, 7,706 acres did not overlap with areas eliminated for sensitive resources and the ¼-mile law. Thus,  $7,706 + 78,538 = 86,244$ .

- “Baffles, Berms and Backstops” by David Luke, Range Technical Team Advisor, National Rifle Association. Article available on the National Association of Shooting Ranges website at [http://www.rangeinfo.org/resource\\_library/resLibDoc.cfm?filename=facility\\_mngmnt/design/baffles\\_berms.htm&CAT=Facility%20Management](http://www.rangeinfo.org/resource_library/resLibDoc.cfm?filename=facility_mngmnt/design/baffles_berms.htm&CAT=Facility%20Management)
- Technical advice and information given by Dave Daughtry, Pima County Shooting Sports Program Manager, in a meeting held October 10, 2007 at BLM Tucson Field Office.

Based on these sources, a minimum height of 15 feet for a shooting backstop is acceptable but 20 to 25 feet is recommended. The recommended slope for a backstop is 45 degrees or greater. Because these criteria were established for constructed ranges, and not for unmanaged, open shooting areas, they were taken as guidelines to evaluate the natural terrain’s capability to provide target shooting site backstops in the IFNM. For example, areas with a 45 degree slope are very scarce in the IFNM, so this was not included as a primary criterion to locate safe shooting areas. On the other hand, a hill rising to 15 or 20 feet may not be sufficiently safe, depending on the slope of the hill, position of shooter, and other factors.

In order to locate all areas in the IFNM with potentially appropriate backstop dimensions, and thus providing areas for safe shooting, BLM used GIS software to perform a terrain analysis identifying areas within the monument that have slopes steeper than 15 degrees. This lower-threshold dimension was employed so that all areas with significant elevation changes could be identified and examined further for their potential as safe shooting areas; the intent was to cast a wide net so that all potential areas could be considered. A 400-yard buffer was then placed around these areas to encompass a typical shooter-to-target distance. Areas identified under this exercise are called “potential shooting terrain.”

Of the 128,000 total BLM acres in the IFNM, 47,017 acres of BLM land were found to be within “potential shooting terrain” (see Map I-9). Of those 47,017 acres, 2,965 acres did not conflict (or overlap) with the 86,244 acres already eliminated from consideration, as identified above<sup>7</sup>. These 2,965 acres are depicted on Map I-10, and were further scrutinized during on-site visits, as described in section 2 below. The remainder of the IFNM was not considered further in this analysis.

## 1.5 Results of GIS Analysis

Based solely on the criteria used for this GIS analysis, approximately 2.3% of the IFNM is potentially suitable for recreational target shooting activity, subject to on-site analysis. This is significant because these preliminary GIS results indicate that the management of target shooting in the IFNM should probably be dramatically altered, going from the current policy of

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<sup>7</sup> Some small, flat areas at the bases of hills that were identified as being within “potential shooting terrain” were cut off from the corresponding hill, or backstop, when the resource sensitivity data was overlaid on the terrain analysis. These small slivers of land (numerous polygons totaling about 670 acres) were eliminated from further analysis because the corresponding backstops, essential to a shooting area, had been eliminated due to resource sensitivity concerns. These 670 acres were subtracted from the 3,635 actual acres of potentially safe shooting terrain that did not overlap with areas that had been eliminated from further analysis to arrive at the 2,965 figure.

allowing dispersed shooting throughout the IFNM to either limiting shooting to relatively small areas, or depending upon the results of the on-site analysis, closing the IFNM to shooting. These management options are discussed in more detail in section 4, below.

## **2. Criteria Evaluated through On-site Analysis**

The next step of the shooting analysis was to conduct on-site visits to the areas encompassing the 2,965 acres identified above. According to the GIS analysis, these areas appeared to meet the following criteria:

- minimal resource concerns present (low potential for resource damage)
- appropriate distance from residences (with regard to the quarter-mile law and emission of shooting noise)
- exhibit terrain potentially suitable for safe shooting (natural landforms providing sufficient backstops)

BLM conducted field visits to these areas to verify site conditions, gather additional information, and evaluate the areas with regard to their overall suitability for shooting activity. During the on-site visits, the second set of criteria was evaluated, as listed in Table 1 above and described in greater detail below. These criteria predominantly represent data that cannot be mapped by GIS, has never been mapped, or is too site-specific to be feasible for GIS application. They include factors that are important to the target shooting analysis but are primarily dependent upon the characteristics of a specific area.

To facilitate the on-site analysis process, BLM divided the 2,965 remaining acres into eight study areas (see Map I-10). These study areas are based on the geographic location of each polygon and common characteristics. Some areas contain one polygon while others contain two. Each area was given an overall ranking of high suitability, moderate suitability, or low suitability for target shooting activity based on the on-site criteria and the best available information for each area. Definitions for high, moderate, and low suitability under each of the categories were developed by a BLM interdisciplinary team and are provided in the accompanying tables below, along with rationale for the definitions where needed. Because the definitions contain some specific measurements and explicit criteria, many of the sites did not fit precisely under only one definition; it was in fact unusual for an area to exclusively meet all the specific criteria listed in a given definition. Therefore, the definitions were considered as general guidelines for evaluating and assigning a ranking to each area, while using the best available information for each site.

### **2.1 Significant presence of monument objects or high natural and cultural resource sensitivity (not captured through GIS analysis)**

The data layers used in the GIS analysis to locate areas with high resource sensitivity included specific types of natural and cultural resources that represent areas with a significant presence of monument objects or with high natural and cultural resource sensitivity. They do not represent comprehensive surveys of all monument objects and resources that warrant protection. Because they are not comprehensive, on-site visits to potentially suitable shooting areas were conducted to determine if additional resources that were not captured in the GIS analysis were present. A good example is BLM's consideration of cultural data. While cultural data was used in the GIS analysis, only about 15% of the IFNM has been surveyed for cultural resources. During site visits, additional cultural resources were observed in some areas. This information was included and considered in the suitability rankings.



The following resource-related factors were observed during site visits:

- Characteristic vegetation; type and density of vegetation
- Presence of special status species habitat
- Presence of other biological resources
- Presence of geological resources
- Presence of cultural resources
- Presence of other objects of historic and scientific interest
- Visibility and visual quality

BLM developed the criteria in Table 2-1 below to rank suitability for target shooting in specific areas with regard to protection of resources and monument objects. These rankings were considered together with rankings from other criteria to determine overall suitability for shooting activity in each area (see section 3 below). Rationale for these criteria is discussed above in section 1.1.

**Table 2-1: On-site Criteria for Resources and Monument Objects**

<b>Low Suitability</b>	High diversity of vegetation; exemplary plants and assemblages present; dense vegetative cover and canopy; within sensitive wildlife habitats; within “suitable” pygmy owl habitat (as determined by the pygmy owl habitat occupancy assessment); known desert tortoise burrowing areas/sites in area; raptor nesting sites in area; high potential for defacing and damaging geological features; cultural resources present; area visible from main access routes; high potential for new noticeable visual contrast; no existing visual impacts
<b>Moderate Suitability</b>	Moderate diversity of vegetation, no exemplary plants and assemblages present, moderate vegetative cover and canopy; away from sensitive wildlife habitats; within “possibly suitable” pygmy owl habitat (as determined by the pygmy owl habitat occupancy assessment); no known desert tortoise burrowing areas/sites in area; no raptor nesting sites in area; minimal potential for defacing and damaging geological features; no known cultural resources present; area minimally visible from main access routes; low potential for new noticeable visual contrast; noticeable visual impacts present
<b>High Suitability</b>	Low vegetation diversity, no exemplary plants or assemblages present or adjacent, free of vegetative cover, or sparse vegetation; away from sensitive wildlife habitats; area determined to be “not suitable” for pygmy owl habitat (as determined by the pygmy owl habitat occupancy assessment); no known desert tortoise burrowing areas/sites in area; no raptor nesting sites in area; no potential for defacing and damaging geological features; no known cultural resources present; area not visible from main access routes; low potential for new noticeable visual contrast; noticeable visual impacts present

## 2.2 Visitor Safety; Nearby Uses and Facilities

The location of certain uses, sites, and facilities on the IFNM, relative to the location of target shooting activity, is an important factor because of issues related to visitor safety, incompatible uses, and protection of property. During on-site visits, the BLM identified nearby uses and facilities that could be affected by or have a bearing on shooting (according to the preferred

alternative of the RMP, where applicable), as well as potential safety issues with regard to proximate uses and activities.

The following factors were observed during site visits:

- Nearby facilities and other sites or areas temporarily occupied by persons, including:
  - a. Designated camp sites, large group sites, and staging areas  
Rationale: temporary occupancy, user safety, visitor experience
  - b. Corrals, stock ponds, tanks, wells, windmills, troughs  
Rationale: temporary occupancy, user safety, damage to facilities, disturbance of livestock
  - c. Wildlife waters  
Rationale: user safety, disturbance to wildlife, damage to facilities
  - d. Dispersed recreation areas (trailheads, etc)  
Rationale: temporary occupancy, user safety, visitor experience
  - e. Cultural sites designated for public use  
Rationale: temporary occupancy, user safety, visitor experience
  - f. Utility corridors and facilities (utility lines, pipelines, communication sites)  
Rationale: user safety, damage to facilities
- Location of roads and trails  
Rationale: user safety; state law does not allow shooting across or into roads (*A.R.S. 17-301b: No person may knowingly discharge any firearm or shoot any other device upon, from, across or into a road or railway*)
- Other potentially sensitive or conflicting land use activities in the area, or other nearby uses that could facilitate shooting activity

During site visits, BLM found that Sasco Road and Silverbell Road, two of IFNM's four major entrance and touring roads, were both within 0.5 to 1 mile shooting fan of a "potential shooting terrain" area of 139 acres east of the intersection of Sasco and Silverbell Roads. The topographical and other physical constraints of this small area would require potential shooters to shoot in a west to northwest direction toward Sasco and Silverbell Roads. This area was excluded from further analysis due to these clearly unsafe conditions.

BLM developed the criteria in Table 2-2 below to rank suitability for target shooting in specific areas with regard to safety and protection of nearby uses and facilities. These rankings were considered together with rankings from other criteria to determine overall suitability for shooting activity in each area (see Section 3 below). Rationale for the specific distances included in the criteria is also provided.

**Table 2-2: Criteria for Safety and Nearby Uses and Facilities**

<b>Low Suitability</b>	Within ¼ mile of livestock and wildlife waters, and corrals; within ¼ mile of designated camp sites, trailheads, and other temporarily occupied sites; roads or trails, livestock and wildlife waters, designated camp sites, trailheads, and other temporarily occupied sites, communications sites, utilities, or other surface facilities within 1 mile shooting fan; occupied residences within 1.5 to 2.5 mile shooting fan
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<b>Moderate Suitability</b>	At least ¼ mile from livestock and wildlife waters, and corrals; at least ¼ mile from designated camp sites, trailheads, and other temporarily occupied sites; no roads or trails, livestock and wildlife waters, designated camp sites, trailheads, and other temporarily occupied sites, communications sites, utilities, or other surface facilities within 1 to 1.5 mile shooting fan; occupied residences within 2.5 to 3.5 mile shooting fan; at least 1.5 miles from closest residence or areas likely to be developed for residential use
<b>High Suitability</b>	At least ¼ mile from livestock and wildlife waters, and corrals and livestock gathering areas; at least ¼ mile from designated camp sites, trailheads, and other temporarily occupied sites; no roads or trails, livestock and wildlife waters, designated camp sites, trailheads, and other temporarily occupied sites, communications sites, utilities, or other surface facilities within 1.5-mile shooting fan; no occupied residences within 3.5-mile shooting fan; at least 2 miles from closest residence or areas likely to be developed for residential use
<b>Rationale</b>	<ul style="list-style-type: none"> <li>• <u>Quarter- mile from various temporarily occupied sites</u> – <i>A.R.S 17-309a(4)</i> makes it unlawful for a person to shoot within one-fourth mile of an occupied residence. BLM applied this distance, which is based on safety concerns, to other sites with temporary or limited human occupancy and use, also in consideration of safety.</li> <li>• <u>Shooting fan mileages</u> – A downrange safety fan is an area beyond the backstop that captures that majority of errant bullets. A safety fan must be considered in assuring a safe shooting area. The fan's dimensions will depend on the suitability of the backstop. Sites with less than ideal backstops must have increasingly longer downrange safety fans, approaching the distances of 1.5 miles for pistols and 3.5 miles for high power rifles.<sup>8</sup> Distances of 0.5 mile to 1.5 miles to protect users of roads, campsites, and other temporarily occupied sites are based on these considerations and the imperfect nature of the backstops used for dispersed shooting on the IFNM. Ratings of High, Moderate, or Low suitability for this category do take into account the suitability of the backstop at each given area, with lower requirements for fan distance where highly suitable backstops exist. Shooting fan distance thresholds are higher with regard to occupied residences within the shooting fans than for other temporarily used sites.</li> </ul>

## 2.3 Accessibility

Target shooting in an undeveloped setting on public lands is almost exclusively associated with sites that are accessible by motorized vehicle, with shooting activity occurring very near the vehicle. Travel time and distance is also an important factor for visitors who engage in target shooting. Accessibility of shooting areas is considered in this analysis to account for these factors and to avoid identifying areas for shooting that are not accessible or too remote to accommodate the majority of target shooters. Areas that are not accessible within a short walking distance from an existing road or way were not considered for further evaluation. One area of 201 acres located northwest of the intersection of Sasco and Silverbell Roads was eliminated for this reason.

<sup>8</sup> “Baffles, Berms and Backstops” by David Luke, Range Technical Team Advisor, National Rifle Association. Article available on the National Association of Shooting Ranges website at [http://www.rangeinfo.org/resource\\_library/resLibDoc.cfm?filename=facility\\_mngmnt/design/baffles\\_berms.htm&CAT=Facility%20Management](http://www.rangeinfo.org/resource_library/resLibDoc.cfm?filename=facility_mngmnt/design/baffles_berms.htm&CAT=Facility%20Management)

The criteria in Table 2.3 focus on the travel time/distance and relative ease and ability for the public to access potential shooting locations. Considerations include the condition of access routes, type of vehicle needed for access, and driving time from population served or public highways.

The following factors were observed during site visits:

- Site accessible by road with legal public access
- Travel time from highway/Tucson,
- Physical condition of travel route leading to site, type of vehicle needed
- Available area for parking (wide road, turnouts, etc.)

BLM developed the criteria in Table 2-3 below to rank suitability for target shooting in specific areas with regard to accessibility. These rankings were considered together with rankings from other criteria to determine overall suitability for shooting activity in each area (see section 3 below). Rationale for the specific measurements included in the criteria is also provided.

**Table 2-3: Accessibility Criteria**

<b>Low Suitability</b>	Area is accessible by 4 wheel drive, high clearance vehicles only; one hour or more driving time to arrive from Interstate; site not accessible by existing route; no legal public access
<b>Moderate Suitability</b>	Area is generally accessible by high clearance vehicle; within a 40 minute drive from Interstate; site accessible by existing route
<b>High Suitability</b>	Area is accessible by passenger cars; within a 20-40 minute drive from Interstate; sites accessible by existing route, designated for motorized use in Draft RMP
<b>Rationale</b>	<ul style="list-style-type: none"> <li>• <u>Driving time from Interstate</u> – This factor was based on information related to the amount of time shooters will typically travel to engage in target shooting activities. Interviews conducted with shooters in the Tucson area have revealed that they “want shooting opportunities within a 15-30 minute drive from home.”<sup>9</sup> One professional estimate put the time that Tucson shooters are <i>willing</i> to travel at 45 minutes.<sup>10</sup> Finally, interviews conducted with shooters throughout Arizona indicate that most typically travel about 45 minutes to shoot on federal lands.<sup>11</sup> For the purposes of the definitions below, Interstate-10 is used as the indicator of driving time for the average visitor to the IFNM originating in the Tucson metropolitan area. I-10 runs north-south along the east boundary of the monument, at a distance ranging from approximately 10 to 30 miles from the monument boundary, and is the major feeder of visitors to the IFNM. Driving times for visitors living in the residential areas situated between the I-10 and IFNM would be shorter, while driving times for visitors from Tucson, the major population center served by the IFNM, would be slightly longer depending on their specific origin. I-10 as a starting point does not reflect true driving times for all monument visitors, but is useful in measuring average driving times for visitors to the IFNM.</li> </ul>

<sup>9</sup> “Final Report: Tucson basin Shooting on Public Lands Workshop Project,” 2006. U.S. Institute for Environmental Conflict Resolution, Tucson Arizona. Available at: <http://www.ecr.gov/ecr.asp?Link=406&Project=407>

<sup>10</sup> Dave Daughtry, Pima County Shooting Sports Program Manager, quoted in notes from meeting at BLM Tucson Office, October 10, 2007.

<sup>11</sup> Preliminary results, “Recreational Shooting on Federal Lands (for the Federal Lands Hunting and Shooting Sports Roundtable), Arizona and California; May 2008. Available at BLM Tucson Field Office.

## 2.4 Physical Suitability

While the GIS terrain analysis detected areas on the IFNM with natural shooting backstops, on-site visits were needed to verify the presence of sufficient backstops and gather additional information on the physical characteristics of an area that could facilitate or impede shooting activity and provide for reasonably safe shooting opportunities. Several factors are considered in assessing the physical suitability of an area for target shooting activity. The most significant factors are an area's natural capability to contain bullets and the dimensions of natural landforms to provide a backstop. Other factors include the type of terrain located between the shooter and the backstop, which affects usability of a site for access to the target zone and backstop for setup/take down, and cleanup; the material makeup of the backstop itself, to assess the potential for ricocheting bullets; and the potential for an area to accommodate multiple shooting parties.

The following factors were observed during site visits:

- Size/extent of backstop
- Size of shooting area
- Terrain of shooting area
- Backstop surface

BLM developed the criteria in Table 2-4 below to rank suitability for target shooting in specific areas with regard to their physical suitability. These rankings were considered together with rankings from other criteria to determine overall suitability for shooting activity in each area (see section 3 below). Rationale for the specific measurements included in the criteria is also provided.

**Table 2-4: Physical suitability criteria**

<b>Low Suitability</b>	Site could support only one shooting party at a time; backstop provides horizontal fan under 15 degrees, vertical fan under 5 degrees; backstop surface predominantly hard rock or hard pan material; uneven, broken-up terrain with drainages, washes, dense vegetation or other obstacles that preclude target setup/retrieval and observation of others.
<b>Moderate Suitability</b>	Site could support 2 to 3 shooting parties at one time; backstop provides horizontal shooting fan over 15 to 45 degrees, vertical fan up to 20 degrees; backstop surface of mixed hard rock and unconsolidated material; uneven terrain with drainages or vegetation that could impede target setup/retrieval, and observation of others.
<b>High Suitability</b>	Site could support multiple shooting parties at one time (more than 3 parties); backstop provides wide horizontal shooting fan (greater than 45 degrees), and wide vertical shooting fan (greater than 20 degrees); backstop surface predominantly unconsolidated, loose soil material; fairly even terrain with little or low vegetation that allows for target setup/retrieval and observation of others.
<b>Rationale</b>	<ul style="list-style-type: none"><li>• <u>Number of shooting parties.</u> – Because there is limited terrain potentially suitable for shooting in the IFNM, any area where shooting is allowed to continue should be able to accommodate more than one shooting party. Shooters typically space themselves out from each other, and a site with opportunities for doing so are more favorable than others that only offer close quarters. A site capable of accommodating only one party would promote the expansion of the activity into areas where it is restricted.</li></ul>

	<ul style="list-style-type: none"> <li>• <u>Shooting fan measurements</u> – Larger landforms that provide broad and high backstops for a wide shooting fan are more effective at capturing errant bullets than those with a small hill that provides a narrow and low backstop.</li> </ul>
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### 3. Area Rankings

Table 3-1 shows the four rankings each site received based on the criteria discussed in section 2. A field data sheet for each area can be found in Appendix A.

**Table 3-1: Site Rankings**

Site	Acres	Resources & Monument Objects	Safety, Nearby Uses, Facilities	Accessibility	Physical Suitability
Avra Hill	406	M	L	H	H
Cerrito Represo	223	L	L	H	H
Cocio Hills	493	L	L	L	M
Cocoraque	205	L	M	L	M
Pan Quemado	319	L	M	L	L
Sasco Hills	160	L	L	M	L
Sawtooth North	551	L	L	M	L
Sawtooth South	542	L	L	L	M

**H** = High suitability for shooting area

**M** = Moderate suitability for shooting area

**L** = Low suitability for shooting area

While these rankings do offer a rough indication of the overall suitability of each site, BLM felt it was important to provide a single summary ranking for each site in order to more easily contrast overall suitability between sites and compare findings. To do this, values were assigned to each ranking, where H=2, M=1, and L=0. Each category of criteria was then weighted to reflect the significance of the category with regard to the purpose of the shooting analysis. The primary distinction between shooting on the IFNM and shooting on other BLM lands is the protected status of the biological, cultural, and geological resources on the IFNM. Management concerns and problems related to shooting on the IFNM focus more on resource damage than any other factor. Therefore, protection of resources and monument objects is one of the principal concerns and foci of this analysis, and was given a weight of three (W3). The safety, nearby uses, and facilities category was also assigned a W3 because of its strong human safety component, which is a critical element that must be considered on par with any resource considerations. The physical suitability of an area partially addresses safety issues as well, but also focuses on accommodation of shooting activity and the manageability of an area. These are less significant factors in determining appropriate shooting locations, so this category was given a weight of two (W2). Accessibility was a necessary factor to consider in this analysis, but was probably the least significant because it is relative to each shooter. In addition, areas entirely inaccessible by motorized vehicle were already eliminated from analysis, thus removing one of the most significant factors related to this category. For these reasons the accessibility factor was given a weight of one (W1). Site rankings, based on values assigned to each rating, and weights given to each category, are shown in Table 3-2.

**Table 3-2: Weighted Site Rankings**

Site	Resources & Monument Objects (W3)	Safety, Nearby Uses, Facilities (W3)	Accessibility (W1)	Physical Suitability (W2)	Numeric Suitability Ranking (Scale: 0-16)
Avra Hill	3	0	2	4	9
Cerrito Represo	0	0	2	4	6
Cocio Hills	3	0	0	2	5
Cocoraque	0	3	0	2	5
Pan Quemado	0	3	0	0	3
Sasco Hills	0	0	1	0	1
Sawtooth North	0	0	1	0	1
Sawtooth South	0	0	0	2	2

The next step of the process was to categorize each site based on its numeric suitability ranking. By dividing the 16-digit scale in thirds to generate ranges for low (0 – 5.3), moderate (5.4 – 10.6), and high (10.7 – 16), the sites fall into the following categories:

**Table 3-3: Final site suitability rankings**

Low Suitability	Moderate Suitability	High Suitability
Sasco Hills Sawtooth North Sawtooth South Pan Quemado Cocoraque Cocio Hills	Cerrito Represo Avra Hill	None

#### 4. Analysis of Preliminary Results and Concentration of Shooting Activity

Based on the criteria used for this analysis, about 629 acres, or 0.5% of the IFNM can be defined as moderately suitable for target shooting activity, with the rest of the monument considered not suitable or demonstrating low suitability characteristics. These findings are significant because they show that very few locations on a landscape level could qualify as appropriate places to continue target shooting activity in the IFNM, and none exist that are ideal for accommodating this activity. The results of this analysis also indicate that shooting activity, were it to continue in the monument, would probably be limited to these two areas only. Thus, Cerrito Represo and Avra Hill must be further examined for their suitability in the context of moving all shooting activity in the IFNM to these two areas.

#### **Analysis of effects of limiting shooting to Avra Hill and Cerrito Represo**

##### *A. Probable significant increase in damage to monument objects and resources*

Target shooting activity is currently dispersed throughout the entire IFNM and recurring activity has been documented at 34 individual locations. Reducing the number of locations where shooting regularly occurs from 34 to 2 would cause significant impacts to these two locations because of the increased concentration of shooting activity that would occur there. Current shooting activity at Cerrito Represo and Avra Hill has already caused extensive damage to vegetation, geology, soils, cultural artifacts, and other resources, as shown in figures 1 and 2

below. Broad strips of land devoid of vegetation with disturbed rocks and soils and littered with brass and remnants of targets have appeared as a result of concentrated shooting in these areas. Cacti, trees, and bushes are frequently used as targets or as target holders (see figures 3 through 7). When vegetation in the vicinity is not specifically targeted by shooters, it is damaged by errant bullets, frequent trampling from target set-up and retrieval, ricochet, and other related causes.

Concentrating a significant quantity of additional use at these sites would cause this type of disturbance to spread further throughout the areas, affecting monument objects that are not currently in the probable line of fire. Additional shooters would intensify use of each area and create additional shooting lanes. In addition to the damage that would occur at the backstop and foreground, additional use would expand impacts to vegetation and other resources in the parking areas of each location. Generally, the current shooting sites would expand in size to eventually accommodate those shooters who had been displaced by closure of the rest of the monument. To visualize this potential scenario at Avra Hill, pictures of three sites within three miles of Avra Hill are shown below (figures 8 through 10). The impacts associated with these sites (in addition to the impacts from 10 other shooting sites within three miles of Avra Hill that are not pictured here) would be transferred to Avra Hill.

*B. Potential safety issues associated with each area*

Cerrito Represo and Avra Hill both received ratings of low suitability with regard to safety and nearby uses. Suitability with regard to safety would be decreased even further if all shooting use were to be concentrated in these areas. An administrative route that accesses two water facilities is located within a half-mile shooting fan of the Cerro Represo site, and another administrative route accessing a communications site is located within a two-mile shooting fan. Additional range facilities located less than 100 feet from the shooting area are frequently vandalized and used as targets. This potential shooting area also comprises one hill with roads accessing almost the full radius of the hill's base. If shooting was concentrated in this area, various shooting parties could very likely surround the hill at different locations, creating the unsafe scenario where each party is located in another party's shooting fan. At the Avra Hill site, pedestrian/equestrian trails are located within half-mile and mile shooting fans, and administrative routes and public roads are within a two mile shooting fan. Concentrated shooting at these sites would increase the safety threat considerably by increasing the frequency of the threat, making target shooting unsuitable for these locations.

In summary, increased concentration of shooting activity in the Cerrito Represo and Avra Hill areas would create significant problems related to increased environmental impacts and visitor safety, making Cerrito Represo and Avra Hill unsuitable for continued target shooting under this scenario. Therefore, the IFNM in its entirety should be considered an unsuitable area for continued target shooting activity, primarily based on the impacts to resources and safety considerations described above.



**Figure 1: Cerrito Represo Shooting Area**



**Figure 2: Avra Hill shooting area**

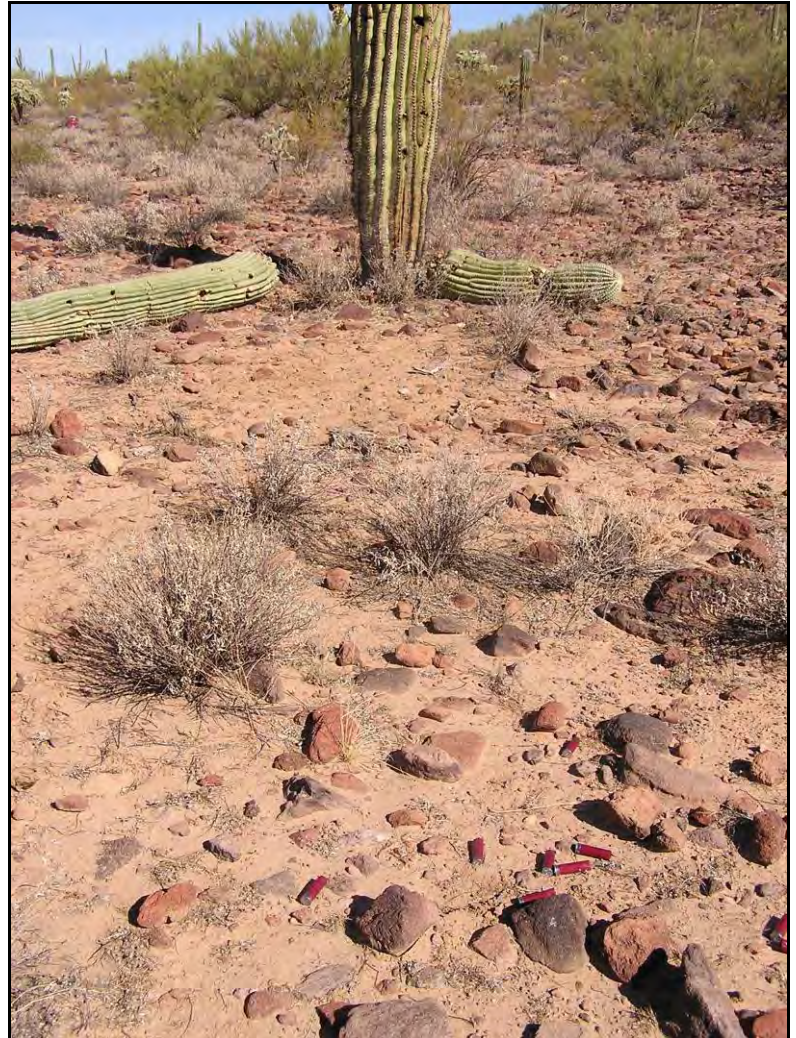




**Figure 3: Saguaro cactus used as target**



**Figure 4: Saguaro cactus used as target; arms shot off**



**Figure 5: Target placed in mesquite tree**





**Figure 6: Ironwood tree used as target**



**Figure 7: Shooting area on Johnson Mine Road, just southwest of Avra Hill shooting area**





**Figure 8: Shooting area on pipeline road just east of Avra Hill shooting area**



**Figure 9: Shooting area on Johnson Mine Road, just southwest of Avra Hill shooting area**



## **5. Management Scenarios**

The IFNM should generally be considered unsuitable for continued target shooting activity based on the findings of this analysis. To provide context and further disclose the effects of target shooting on the IFNM, the potential impacts of four different management scenarios are provided below.

### **5.1 Management Scenario A: Limit target shooting to specific sites**

The BLM could allow target shooting to continue only at specific, identified sites. These sites would probably be located within the most suitable areas as determined in Tables 3-2 and 3-3. All shooting activity would be consolidated at these sites, which would decrease damage to resources in other areas, reduce the likelihood of new target shooting destinations being created outside of these sites, and limit potential conflicts with non-shooting users of the monument. Target shooting violations could also be monitored more closely by law enforcement. Damage to resources at these sites would increase in extent and severity, though limits of acceptable change could be applied to mitigate damage. If thresholds are reached, adaptive management actions would be triggered that could include signing, other public education actions, and increased law enforcement; limits on the types of weapon or ammunition that may be used; and/or, temporary or permanent closure of the site to target shooting. Other impacts under this scenario would include increased potential for conflicts between shooting groups and an increased likelihood of unsafe shooting conditions, as more shooters congregate at a limited number of sites. Proliferation of unauthorized shooting sites would likely increase as many shooters who encounter a site already in use will find an alternative site in the general vicinity, or just further down the road. Shooting sites under this scenario would need to be clearly delineated with signs and/or fences to confine shooting activity to appropriate areas.

### **5.2 Management Scenario B: Limit target shooting to specific zones**

The BLM could allow target shooting to continue only within specific areas, or zones. Zones would be larger areas than the sites described under Scenario A, and zone locations and boundaries would generally be based on the most suitable areas for target shooting as determined in Tables 3-2 and 3-3, totaling around 648 acres. Scenario B would allow for greater dispersal of shooting and associated impacts than Scenario A, while still confining the activity to appropriate locations. Other impacts would be very similar to those described under Scenario A, except that shooting impacts would cover a larger area. Unsafe shooting conditions and conflicts between shooting groups could also increase at a local level under Scenario B as shooting is confined to several sites within a relatively small zone. This scenario increases the probability that a shooting party would be located in the shooting fan of another party using the same zone, or otherwise located in an unsafe area relative to other shooting parties.

### **5.3 Management Scenario C: Allow target shooting throughout the IFNM**

The BLM could allow target shooting to occur throughout the monument, which would be a continuation of current management. This would further disperse the environmental impacts of target shooting when compared to Scenarios A and B, but these impacts would continue to increase and spread throughout the monument. Shooting would continue to occur in areas that have been identified as unsuitable for target shooting activity, and monument objects would continue to be damaged on a broad scale. Unsafe conditions monument-wide would increase when compared to Scenarios A and B. Conflicts between shooters and non-shooting users of the monument would increase, but conflicts between shooting parties would decrease when compared to Scenarios A and B. New target shooting sites are likely to be created by users.

Limits of acceptable change would be established for certain areas where concentrated target shooting has been documented over time, and adaptive management actions would be the same as those listed under Scenario A. Enforcement of shooting rules and regulations would continue to be a challenge.

#### **5.4 Management Scenario D: Prohibit target shooting throughout the IFNM**

The BLM could prohibit target shooting throughout the IFNM. This would decrease resource damage and visitor conflicts on the IFNM and increase public safety. The shooters who currently visit the IFNM to target shoot would be displaced, and shooting activity would increase on non-monument BLM lands and other lands in the vicinity. Unauthorized target shooting on the IFNM would probably result; however, law enforcement could more effectively detect unauthorized activity.